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Visions of Nature and Environmental Sustainability: Shellfish Harvesting in the Dutch Wadden Sea

Jac. A. A. Swart^{1,2} and Henny J. van der Windt¹

Abstract

The concept of sustainability has several, sometimes contrasting, meanings that may generate confusion, misunderstanding, and conflict concerning conservation and restoration practices. It is therefore desirable to clarify the concept of sustainability, thereby potentially contributing to mutual understanding, especially when social conflicts arise. This article discusses a recently published typology of three conceptions of sustainability that range from economic to ecocentric valuations of nature. We argue that

the typology is incomplete because it does not include the arcadian approaches. For this reason, we introduce a “tripolar model” for conceptions of sustainability, applying it to the debate on shellfish harvesting in the Dutch Wadden Sea. We conclude that the particular visions or conceptions of sustainability held by relevant actors may have an impact on strategies for conservation.

Key words: conceptions of sustainability, shellfish fishery, visions of nature, Wadden Sea.

Introduction

The concept of sustainability is relevant to conservation and restoration because it implies durability in the human utilization of the natural environment. The positive connotation of this term stems from its potential for applying social and technological innovations to the search for a lasting reconciliation between nature and the use of nature by humans. For example, sustainable harvesting techniques may contribute to the subsistence of threatened species and ecosystems. Sustainability is nevertheless also a “buzz word” (Callicott 1997) that is subject to widely differing interpretations. For example, the World Commission on Environment and Development (WCED) relates the concept of sustainability to socioeconomic development, arguing, “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987, p. 43). Callicott and Mumford (1997) propose somewhat less anthropocentric approaches that stress ecology-related concepts, defining ecological sustainability as follows: “meeting human needs without compromising the health of ecosystems.” More radical approaches to sustainability stress the concept of biological integrity. For example, Noss (1995) asserts, “A biocentric or holistic concept of sustainability focuses on sustaining natural ecosystems and all their components for their own sake, with human uses included only when they are entirely compatible with conservation of native biota and natural processes” (cited from Callicott & Mumford 1997).

Thus, the concept of sustainability has several, sometimes contrasting, meanings that may generate confusion, misunderstanding, and conflict in conservation and restoration practices, which often refer to sustainability. Dobson (1998) identifies approximately 300 definitions of sustainability currently in use. For this reason, it is desirable to clarify the concept of sustainability in conservation and restoration, thus potentially contributing to mutual understanding, especially when social conflicts arise. Visions of sustainability may also have consequences for the adoption of conservation strategies. For example, the question of whether the focus of conservation or restoration efforts should be on species or on ecosystems carries broad implications for practice (Pikitch et al. 2004). Few attempts have been made to chart the visions of sustainability that have already been published. One exception is a study by Dobson (1998), who studied the concept of sustainability in relation to the concept of environmental justice.

Instead of searching for the best definition, Dobson presents a scheme for visions of sustainability that sought to provide “a full account of the constitutive dimensions within which the discussion on the concept must move” (1998, p. 34). Dobson (1998) distinguishes environmental sustainability from sustainable development. The latter concept refers to causes (poverty, disempowerment, etc.) and remedies (equity, empowerment, etc.), whereas environmental sustainability contains views “on what is to be sustained, on why, on what the object(s) of concern are, and (often implicitly) on the degree of substitutability of human-made capital for natural capital” (p. 60). According to Dobson, this distinction is important, because it allows the concept of sustainability to extend beyond its anthropocentric understanding (p. 61).

Dobson based his approach on a survey of a considerable volume of literature concerning sustainability,

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ensuring that the resulting typology would cover a wide spectrum of definitions. Whether the resulting visions of sustainability actually exist in practice—particularly within the context of environmental conflicts—is not clear, however, because most of the works addressed in Dobson's (1998) review are theoretically oriented. Our article presents a discussion, extension, and application of an adapted version of Dobson's (1998) typology to the case of shellfish harvesting in the Dutch Wadden Sea. In the early 1990s the Dutch government launched a new policy to conserve and restore natural resources in this area. The initiative focused particularly on the recovery of eelgrass beds and stocks of cockles and mussels that had been compromised by overexploitation and habitat destruction. For more than a decade, shellfish harvesting has been the focus of heated debates concerning sustainability. Because it concerns a defined ecosystem and involves a limited number of actors who have published opinions on sustainability, it provides a suitable context within which to apply a typology of conceptions of sustainability.

We begin by outlining and discussing Dobson's (1998) analysis, on which we based our approach. We then propose an alternative model that extends the spectrum of environmental sustainability by adding the "arcadian" conception of nature, which values moderate human impact positively. Following a description of the Wadden Sea and an overview of the conflict about shellfish harvesting in this area, we then use our model to analyze the conceptions of sustainability held by the main actors in this conflict.

Dobson's Approach to Environmental Sustainability

On the basis of an extensive scan of the literature Dobson (1998) uses the following five questions to describe different conceptions of sustainability: What is to be sustained?

Why is it to be sustained? How is it to be sustained? How are the needs and wants of future and present generations (human and nonhuman) prioritized? Can human-made capital be substituted for natural capital? The author labels the resulting understandings of sustainability as the *critical natural capital*, *irreversible nature*, and *natural value* conceptions of sustainability (Table 1).

According to the critical natural capital conception of environmental sustainability (Dobson 1998, pp. 43–44), natural capital that is critical to human welfare and that cannot be replaced by equivalent human-made products (e.g., biochemical cycles) should be preserved. From this perspective, sustainability can be achieved through the use of such tools as renewal (e.g., forestry), substitution (e.g., nuclear energy for oil-based energy), and protection (e.g., biodiversity, as far as it is useful for humanity). This anthropocentric character places higher priority on the needs and wants of present and future generations of humans than it does on the needs of nonhumans.

The irreversible nature conception of sustainability considers the irreplaceable intrinsic or noninstrumental value of nature, along with its utility for human populations. Biodiversity should therefore be protected or preserved, regardless of its utility. The intrinsic value prevents the pure application of calculus of trade-offs and also means a duty or obligation to protect nature (Dobson 1998, p. 48). This approach is not absolute, however; the gains resulting from a loss should also be taken into account, and distinctions should be made among various types of loss. For example, the loss of an individual organism is, of course, irreversible, but it is of less consequence than the loss of an entire species. By definition, irreversibility excludes the possibility of renewal. Substitution and protection are therefore the only sustainability tools remaining in this conception, although the substitution of human-made commodities for irreversible nature is assumed to involve some degree of devaluation. The ecocentric element of

Table 1. Conceptions of environmental sustainability (after Dobson 1998).

Questions	Critical Natural Capital Conception	Irreversible Nature Conception	Natural Value Conception
1. What is to be sustained?	critical natural capital	irreversible nature	natural (intrinsic) value
2. Why is the object of question 1 to be sustained?	human welfare	human welfare and duties to nature	duties to nature
3. How can the object of question 1 be sustained?	renewal, substitution, protection	substitution, protection	protecting
4. How should the objects of concern be prioritized? (see legends)	A > B > C > D > E > F	A > E > B > F > C > D	(A, E) > (B, F) > C > D
5. Can human-made capital substitute or compensate for natural capital or nature?	to considerable extent, but not always possible	not always possible	not possible in practice

A, present generation human needs; B, future generation human needs; C, present generation human wants; D, future generation human wants; E, present generation nonhuman needs; F, future generation nonhuman needs.

this conception tends to assign higher priority to the needs of present and future generations of nonhumans than it does to the future wants of humans.

The natural value conception of environmental sustainability values nature for its own sake: Nature has an intrinsic value that must be respected and protected. Dobson (1998) cites Holland (1994, p. 179), who argues for "the recognition that nature, and its various component events and processes, is a particular historical phenomenon and should be valued as such." This "environmental interest in nature" is not only secured through concern for present and future generation human beings but it implies, according to Dobson (1998), also an "obligation to nature" (p. 52), which does not however rule out the possibility that nature can contribute to human welfare. Because nature is a dynamic entity, natural elements are renewed through natural processes (e.g., the natural replacement of older trees by younger ones). Substitution of nature by human-made equivalents is not acceptable, because nature should be allowed to take its own course. Protection is therefore the only acceptable tool for attaining environmental sustainability from this perspective. Because it is based upon strong ecocentric reasoning, the present and future generation nonhuman needs are given a very high priority. Non-human needs may sometimes have a higher priority than human needs.

In line with other authors (Callicott & Mumford 1997), Dobson's (1998) typology extends the concept of sustainability from the economic to the ecocentric domain. Such economic approaches as the distinction between weak and strong sustainability (e.g., Pearce 1993) consider nature primarily as a resource or capital, for which other economic resources can or cannot be substituted. Dobson (1998) uses the term "capital" only in discussing the critical natural capital conception and not for the other two conceptions. The latter conceptions allow little room for economic reasoning because this tends to devalue nature.

The Arcadian Nature Conception of Sustainability: Extending Dobson's Approach

According to Dobson (1998) there are two sides to the irreversibility coin, owing to its "privileging of human welfare over obligations to nature" and "calling compensation into question through the introduction of the notion of intrinsic value" (p. 50). His model is therefore essentially bipolar, with the critical natural capital and natural value conceptions forming the outside positions and the irreversible nature conception located between them.

Whether this typology indeed provides "a full account of the constitutive dimensions" within which discussion on the concept of environmental sustainability must move (Dobson 1998, p. 34) has yet to be demonstrated. Dobson's sustainability space is restricted by both the questions it poses and the answers it provides (Table 1).

The answers range roughly between anthropocentric and ecocentric positions regarding nature.

We use a model proposed by Swart and colleagues (Swart et al. 2001; Keulartz et al. 2004) for the valuation of nature to examine the completeness of Dobson's approach. The model distinguishes three main approaches of nature: the functional, wilderness, and arcadian approaches, which are all based upon underlying ecological, ethical, and aesthetic considerations. The functional approach values nature primarily for its utility to humans (e.g., production and recreation), as exemplified by accessible reserves, parks, gardens, and pastureland. The wilderness approach attaches particularly high value to nature in its unspoiled state. The presence of authentic species and the occurrence of natural processes (e.g., erosion, sedimentation, dispersion, competitions, and natural evolution) are important. Utilization is unimportant and acceptable only if its effects are negligible. The arcadian approach refers to seminatural and extensively used cultural landscapes, in which human impact is often considered to be a characteristic element that may even contribute to biodiversity and the landscape. Proponents stress the responsibility of humans to care for the environment, referring to the mutual dependence existing between humans and nature. Arcadian writers frequently refer to historical elements, traditional knowledge, and utilization practices (both extensive and small-scale). The aesthetic appreciation of arcadian nature or landscapes is often guided by historic, subjective considerations. Community ecology provides a basis for ecological considerations. The ethical dimension of the arcadian approach is characterized by ideas of stewardship, care, and the connectedness of humans with the biotic and abiotic environments.

The functional approach appears analogous to the critical natural capital conception of sustainability, and the wilderness approach appears consistent with the natural value conception. The arcadian approach, however, does not fit very well into Dobson's (1998) model, because it does not represent an intermediate point between the functional and wilderness approaches but represents a vision in which human presence and influence is valued for its own sake. For example, many areas of the European countryside can be classified as arcadian, because they have evolved through long-standing interaction with agricultural practices (Naveh 1998). Examples of the arcadian approach can also be found in literature on local and traditional ecological knowledge. Traditional knowledge contains the cumulative body of local knowledge, practice, and beliefs that have evolved among indigenous peoples through practical learning and are often transmitted through oral tradition (Berkes 1999; Berkes et al. 2000; Salmón 2000). This and comparable concepts play a role in the debate on sustainability, conservation, and restoration, because many indigenous peoples have demonstrated an ability to maintain their environments for thousands of years (WCED 1987; Mauro & Hardison

2000; Turner et al. 2000; Higgs 2003). We must emphasize that it is not necessary to interpret the arcadian conception in archaic terms; it is also appropriate to make use of current scientific insights (Berkes 1999, p. 156).

Seminatural landscapes and those that are embedded within historical or cultural contexts are often considered to be sustainable, because they have existed for rather long periods of time. This fact provides evidence that this vision is indeed related to a conception of sustainability. We therefore propose to extend Dobson's (1998) bipolar model of sustainability to include the arcadian nature conception as an additional conception of sustainability. This understanding is characterized by an arcadian vision of nature, small-scale human activities, and participative management to maintain balance in the mutual dependency of humans and nature. Communitarian commitment and the historic fidelity of the natural environment are important motives. Because arcadian landscapes have often evolved in interaction with traditional land use, renewal occurs only slowly, and substitution by modern production landscapes is considered as a natural loss. Protection and restoration are important strategies for conservation, which can take the form of user subsidies for sectors that choose for extensive management (e.g., in forestry, farming, and fishing).

As are the conceptions included in Dobson's model, the arcadian nature conception of sustainability should be considered as an ideal type. Its pure form is usually not found in practice, and its practical manifestations often include elements from other conceptions. For example, Higgs (2003) stresses the importance of involving local communities in the practice of restoration in order to ensure both ecological and cultural fidelity in a process that he refers to as "focal restoration." The arcadian approach may be important for nature conservation efforts in developing countries, which lack the support of local communities. More attention to opportunities for involving local people and for connecting conservation objectives to their way of life may contribute to the success of sustainability initiatives. For a debate on this issue, see for example Ferraro and Kiss (2002, 2003) and Swart (2003). Table 2 presents several characteristics of the

arcadian nature conception according to the five questions posed by Dobson (1998). In particular, answers to the what, why, and how questions differ from those in the irreversible nature conception. Figure 1a outlines our modification of Dobson's (1998) bipolar model. Our proposed tripolar triangular representation also subsumes Dobson's (1998) model. Our model clearly provides many more positions than does Dobson's (1998) bipolar model, thus supplying analysts with many more possibilities to assess the positions and alliances of actors within the realm of sustainability.

The Wadden Sea

The Wadden Sea is a shallow sea (8,000 km²) with extensive tidal flats, salt marshes, sandbanks, and barrier islands along the coasts of Denmark, Germany, and the Netherlands. It is one of the largest wetlands in Europe and ranges from the city Den Helder in the Netherlands (lat 52°57'N, long 4°43'E) to the Danish city Esbjerg (lat 55°28'N, long 8°25'E). Forces of wind and water combine to sculpt the landscape through sedimentation and erosion. The Wadden Sea area is characterized by a fairly high level of primary production and functions as a nursery for many species of fish. The nearby islands, salt marshes, and intertidal areas are important resting and wintering sites for migratory birds. In addition to species of invertebrates, fish, and birds, populations of such mammals as the Common seal (*Phoca vitulina*) and the Gray seal (*Hali-choerus grypus*) can be found in the area. Wolff (1983) provides an extensive ecological description of the Wadden Sea.

Located at the rim of a densely inhabited area of northwestern Europe, the Wadden Sea has been profoundly affected by centuries of human use. Dikes that were built over many centuries form a sharp border between the sea and the continental land. The former Zuiderzee was dammed in 1932 and transformed gradually thereafter into a freshwater lake, the IJsselmeer (Wolff 1992). In the 1960s plans to embank portions of the Dutch Wadden Sea led to public controversy and to the founding of the Dutch

Table 2. The arcadian nature conception of environmental sustainability.

Questions	Arcadian Nature Conception
1. What is to be sustained?	enduring mutual dependency of people and nature communitarian commitment and historical fidelity of the natural environment protection and restoration (and, to a lesser extent, renewal or substitution)
2. Why is the object of question 1 to be sustained?	
3. How can the object of question 1 be sustained?	
4. How should the objects of concern be prioritized? (see legends)	A > E > B > F > C > D
5. Can human-made capital substitute or compensate for natural capital or nature?	not always possible

See Table 1 for legends.

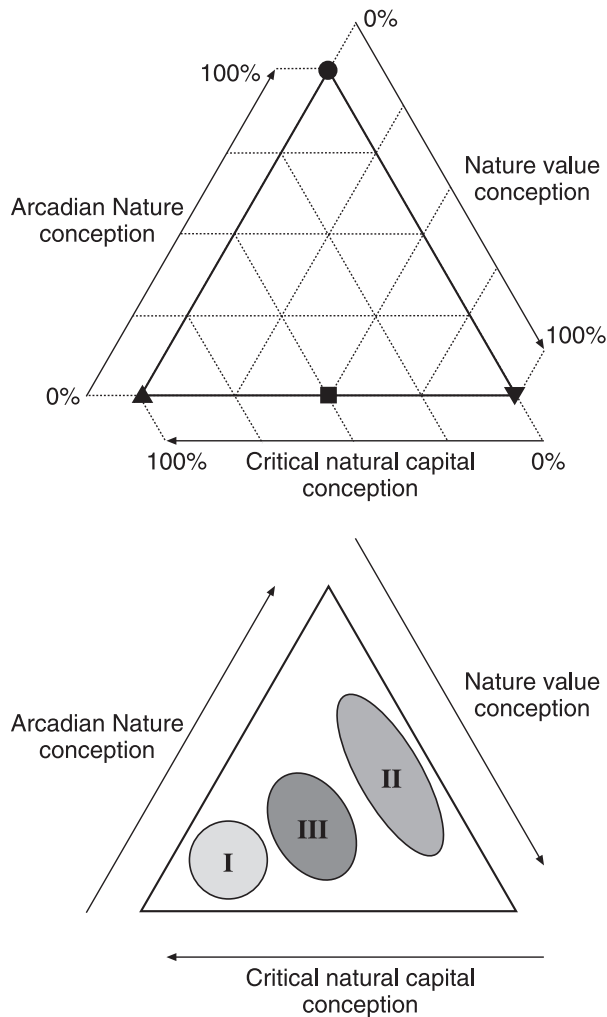


Figure 1. (a) Triangular representation of the tripolar model of sustainability. The model subsumes Dobson's (1998) conceptions of sustainability and the ideal type of the arcadian natural conception. \blacktriangle , Critical natural capital conception; \blacksquare , irreversible nature conception; \blacktriangledown , natural value conception; \bullet , arcadian nature conception. (b) The supposed positions of three actors derived from policy documents in the debate concerning shellfish harvesting in the Dutch Wadden Sea, mapped onto the triangular representation of sustainability. I, shellfish organizations; II, Wadden Society; III, government.

Society for the Preservation of the Wadden Sea in 1965 (Wolff 1997). As a result, the plans for embankment were canceled, and the area was recognized as an important natural area.

Shellfish harvesting, especially for Blue mussels (*Mytilus edulis*) and cockles (*Cerastoderma edule*), has always been an important activity in this area. The mussel banks function as an important source of mussel seed for sublittoral mussel-breeding culture in this and other Dutch coastal areas. Modern suction-dredging equipment is used to exploit cockles, which are exported primarily for consumption (Dijkema 1997; Ens 2003). In addition,

the Wadden Sea is currently an important tourist area, owing to the natural and open characteristics of its landscape and to the opportunities it offers for biking, walking, and sailing. The tourist industry provides support for most of the (approximately 24,000) people living on the Wadden Sea islands, where travelers book more than one million vacations each year (Linnartz et al. 2003).

Threats to Nature

Human activity near the Wadden Sea area has subjected the area to overexploitation, habitat destruction, pollution, and disturbance. For example, the closure of the Zuiderzee has led to increased tidal dynamics and turbidity and probably delayed the recovery of Eelgrass (*Zostera marina*) following an outbreak of the wasting disease during the 1930s. This plant species once covered more than 15,000 ha in the Dutch Wadden region but was almost completely lost (Giesen et al. 1990). The closure was also related to the disappearance of the Zuiderzee race of herring (*Clupea harengus*), due to the loss of its spawn area. Besides the closure of the Zuiderzee, many rivers have been dammed or controlled by sluices and as a consequence species adapted to brackish water conditions have become rare (Wolff 2000a, 2000b).

In the latter half of the twentieth century, chemical pollution and eutrophication became important threats. During the 1960s and 1970s the Common seal nearly disappeared from the Dutch Wadden Sea, probably due to PCB contamination. Although the population of seals later recovered, two outbreaks of the Phocine distemper virus since the 1980s have affected this population. Wolff (2000a, 2000b) observes that overexploitation and habitat changes have been largely responsible for the disappearance of 31 vertebrate species and 20 species of algae and invertebrates in the Wadden Sea or surrounding waters in the past 2,000 years.

International conservation efforts continue to attach high value to the Wadden Sea (Olson & Dinerstein 1998), as reflected in international conventions and agreements. Most of the international Wadden Sea area has been designated as a wetland of international importance, and it is included on the list of the Ramsar Convention (Anonymous, 2003). The European Union Bird and Habitat directives also apply to this area. The three countries bordering the Wadden Sea, Denmark, Germany, and the Netherlands, coordinate the protection of the area according to the terms of the Trilateral Governmental Conferences that are held every 3 or 4 years. The guiding principle in this cooperation is "to achieve, as far as possible, a natural and sustainable ecosystem in which natural processes proceed in an undisturbed way" (CWSS 1992:13). Large portions of the Wadden Sea are protected as national parks. The Dutch Nature Protection Act covers about 95% of the Dutch Wadden Sea. Moreover, achieving the sustainable protection and development of the Wadden Sea and preserving the area's unique open landscape are listed

as the primary objectives of the newly proposed Core Decision on Planning (*Planologische Kernbeslissing*, PKB) for the Wadden Sea. This is an important and binding policy document in the Netherlands (VROM 2001).

Shellfish Harvesting in the Wadden Sea

Storms and a lasting absence of spatfall, combined with overexploitation through mussel seed fishing, were apparently responsible for the nearly complete disappearance of the remaining intertidal stable mussel banks and eelgrass beds—including many plant and animal species depending on these habitats—in 1990, raising considerable alarm because of their protected status. In addition, sporadic spatfall, rapid development of mechanized suction-dredge cockle fishing technology that had begun in the 1960s and 1970s, had reduced the stock of cockles to particularly low levels (Ens 2003). A suction dredge consists of an apparatus that resembles a vacuum cleaner and sucks a layer 3–5 cm deep and 1 m wide from the sea bottom. Shellfish of sufficient size are selected from this material, and the remaining mud and smaller organisms are returned to the sea. The increase in the yearly yield of fresh cockle mass from about 2 million to nearly 80 million kilograms between 1960 and 1989 attests to the efficacy of this technology (Dijkema 1997).

Populations of such characteristic bird species as the Oystercatcher (*Haematopus ostralegus*) and Common Eider Duck (*Somateria mollissima*), which are dependent on stocks of shellfish, began to decline around 1990, particularly in the Dutch Wadden region (Ens et al. 2000). To counteract these developments and to restore the populations of these species, the Dutch government initiated a new management plan (LNV 1993; VROM 1992, 1994). Two important measures contained in the plan were the compartmentalization of the area, closing 26% of intertidal banks to shellfish harvesting and the reservation of shellfish stocks specifically for Oystercatchers and Eider Ducks, such that at least 60% of their needs could be satisfied. In the event that this latter condition could not be met, fishing intensities were to be lowered.

It was hoped that eelgrass beds and mussel banks would recover, and that the populations of shorebirds would recover to the point that they could be maintained at the levels existing between the years 1980 and 1990. The target recovery level for the mussel banks was between 2,000 and 4,000 ha, and the shorebird population goals included about 260,000 wintering Oystercatchers and 130,000 wintering Common Eider Ducks. To achieve these goals fishing boats were equipped with black boxes for the continuous satellite registration of their geographic positions, which were monitored by an independent organization. Fishing organizations agreed to self-regulation in the implementation of the newly imposed fishing regulations and restrictions.

The efficiency of this policy was evaluated in 1998, but no clear conclusions could yet be drawn (LNV 1998). In

1999 regulation was intensified by extending the closed areas to include 30% of the Dutch intertidal banks and by increasing the food reservation level to 70%. It was further decided that a second evaluation study would be carried out from 1999 through 2003 and that this evaluation would subsequently serve as a basic document for revising policies regarding shellfish (Ens et al. 2000).

In the meantime, and in spite of the measures that had been adopted, the debate over the ecological effects of the shellfish harvesting continued. Dutch ecologists described the cascade of consequences caused by the mechanized cockle fishing, leading to a decrease in coastal bird populations of Red Knots (*Calidris canutus*) and Oystercatchers (Piersma & Koolhaas 1997; Piersma et al. 2001). Overexploitation by the mechanized shellfish harvesting was strongly suspected as the cause of the mass mortality among Common Eider Ducks in the Wadden Sea reported during the winter of 1999/2000 (Camphuysen et al. 2002). Some conservationists and their organizations voiced strong opposition to these practices and called for a total ban. The position of shellfish organizations, however, was quite different. According to these organizations, the mortality of the shorebirds was a natural phenomenon, because shellfish stocks fluctuate strongly due to winter conditions and because spatfall does not happen in sufficient amounts every year. Moreover, they perceived the impact of shellfish harvesting to be slight, with the annual yield estimated to be less than 10% of available stocks and the sediment effects of the dredging technology less than those of an average storm.

The controversy gained considerable media attention and led to discussions in parliament. Public attention was facilitated by the fact that food reservation measures required the Ministry of Agriculture, Nature Management, and Fisheries (LNV) to decide each summer the amount of shellfish that could be harvested in the next autumn. Although conservation organizations frequently objected to ministerial decisions, their objections were usually rejected on the grounds that the permits conformed to the official policy, which was scheduled for adaptation after the 2003 evaluation. The evaluation study has recently been published and observes that the disappearance of the intertidal mussel banks around 1990 and the application of modern methods of shellfish harvesting indeed had significant negative effects on shorebird populations through the reduction of shellfish stocks by fishing efforts (LNV 2003). Surprisingly, the layman's version of the evaluation study hypothesizes that reductions in the nutrient load in the Wadden Sea over the past decades could have contributed to a decrease in primary production, thereby also reducing the carrying capacity of the system for shellfish and, consequently, for Oystercatchers and Common Eider Ducks. This conclusion immediately reopened the public debate. In the spring of 2004 an advisory committee published an integral policy plan that covered both shellfish fishery and the long-standing debate concerning the exploitation of

natural gas from the Wadden Sea area (Meijer et al. 2004). The Dutch Cabinet subsequently decided to end cockle fishery from 2005 onwards (VROM 2004).

Visions of Sustainability in the Shellfish Harvesting Conflict in the Wadden Sea

As observed by Adams et al. (2003), many conflicts on managing the commons transcend material incompatibilities, involving not only interests but also deeper beliefs and ideas. Conflicting views on sustainable shellfish harvesting in the Wadden Sea, particularly those of conservationists and fishing organizations, provide an example, as we outline below.

Method

We reviewed literature and documents (e.g., scientific articles, articles in newspapers, and Internet sites) concerning the controversy over shellfish harvesting in the Dutch Wadden Sea. In addition, we studied policy documents from three principal actors in this conflict: the Dutch Society for the Preservation of the Wadden Sea (usually shortened to Wadden Society); the Dutch Product and Trade Organizations for cockles, mussels, and oysters, cooperating with the Society for the Development of Sustainable Shellfish Fishery (ODUS); and the Dutch Ministry for Housing, Spatial Planning, and the Environment (VROM). The Wadden Society is a conservation movement with nearly 50,000 members. The VROM is primarily responsible for the leading policy document, the Core Decision on Planning (PKB) for the Wadden Sea (VROM 1994), in which the LNV participates. These actors have been involved in the debate for many years; they clearly represent the main streams of thought and activities concerning the exploitation and conservation of the Wadden Sea, and they have published documents stating their views. We scanned the main documents from each organization for explicit or implicit answers to the questions listed in Tables 1 and 2. Table 1 is derived from a similar table in Dobson (1998). We adapted this table, particularly the rows containing questions 3 and 4, in accordance with Dobson's (1998) own text, in order to make it more applicable for our purposes. According to Dobson (1998) theories of environmental sustainability should provide answers for all of these questions. This requirement may not be feasible in concrete cases, because the positions stated by the parties involved often reflect strategic rather than theoretical considerations. Direct answers for the fourth and fifth questions were particularly difficult to identify in the documents we considered. They could be derived indirectly, however, because the answers to other questions have implications for the prioritization of concerns and substitutability. Because the documents were published in Dutch, the authors have translated most of the quotations appearing below.

The Position of the Wadden Society

A policy document (Schelvis & Rombouts 2003) of the Wadden Society states that sustainability means that "fishing may have no substantial or lasting impact on either the biotic or abiotic characteristics of the ecosystem in which fishing takes place ..., on ecosystems that are associated with it ..., on the population that is to be fished ..., or on populations of organisms that are dependent on the species that is to be fished." In addition, "the fishing activity may not disturb the experience of calm, grandeur, naturalness or purity of the landscape in which fishing takes place" (p. 15). In effect, the document describes a hands-off situation, although small-scale shellfish harvesting in particular locations is acceptable, provided it does not affect the ecosystem. The position of the Wadden Society reflects the natural value response to the question of what is to be sustained.

The document also refers to the Wadden Sea area as "a unique and valuable area, our last wilderness, an area where people can experience nature ruling the world" (p. 4), and refers elsewhere to future generations of humans as an important reason for striving to achieve sustainable fishing practices. In addition, the Wadden Society stresses the irreplaceability of bird habitats that have been lost (p. 11). Continuation of a branch of industrial fishery is definitely not in keeping with this interpretation of sustainability (p. 14). The ecological system is considered to be of greater importance than the needs of the fishermen, as manifested by the proposal to buy out the cockle fishers. The dominant conservation strategy contained within the document calls for enlarging the number and size of the closed areas at the cost of open fishing areas. Protection through national and international regulation and treaties is the most important conservation tool for this actor. Elements of the arcadian conception can also be identified in the policy documents of the actors discussed above. For example, the Wadden Society states, "Because the Wadden Sea is a tidal area, it is a well-stocked fishing ground that has been utilized by people for centuries. Human activities are appropriate in this area, provided they are carried out with respect for nature and without damaging the ecosystem" (Schelvis & Rombouts 2003:5). Sustainable fishing is, according to this actor, possible in so-called open areas by hand-gathering methods on a limited scale (Schelvis & Rombouts 2003, p. 17).

On the basis of the considerations discussed above we assume the Wadden Society's position to be characterized by both the arcadian nature and natural value conceptions of sustainability, and it can be located along the right flank of the triangle in Figure 1b.

The Position of Shellfish Organizations

Shellfish organizations strive for an "economically profitable and ecologically sound shellfish harvesting that is

accepted by society” (ODUS 2001, p. 12). The ecologically sound requirement refers to “fishing and breeding management directed toward the optimal management of shellfish stocks and a minor disturbance of the sea soil; ... in the longer term no real negative effects on the stocks or the birds foraging upon them, or on the soil and its dependent life; ... striving for optimal management of the stocks such that it contributes to the food supply of shellfish-eating birds” (p. 13). This quotation demonstrates both the critical natural capital and irreversible nature responses to the so-called what question of Dobson (1998).

The position of the shellfish organizations is motivated by the Triple P concept (care for profits, planet, and people) developed by the Dutch Social Economic Council (SER 2000). Because it recognizes both human welfare and respect for nature, this position may be considered to lie close to irreversible nature conception, with regard to the why question. The ODUS organizations demonstrate a critical natural capital response to the how questions, because they consider shellfish exploitation to be a continuous learning process that allows intervention, provided that unacceptable consequences do not occur. This actor strives for more accessible open areas for shellfish harvesting, combined with considerable self-control and adaptive management.

Despite its ecological constraints, the ODUS document proceeds from the assumption that “the continuance of the Dutch shellfish sector (in an economic sense) will be ensured” (p. 17). From this, we can conclude that greater importance is assigned to human needs and desires than to nonhuman needs. In addition, their approach allows for some degree of substitutability, because the ODUS documents plead for the development of commercial cockle breeding and cultivation areas in the Wadden Sea, analogous to practices already in effect for mussel fishing.

The shellfish organization refers directly to its social responsibility. The fishing organizations draw on their traditional knowledge of the sea and their proposals for adaptive management (learning by doing) to counteract the charges that their activities have led to environmental destruction in the area (ODUS 2001). They argue for the potentially positive effects of modern shellfish harvesting methods by claiming that moderate exploitation of mussel banks can contribute to their stability and thus to the maintenance of important habitats. In addition, the development of cockle cultures in the Wadden Sea is supposed to provide additional foraging opportunities for birds (ODUS 2001, pp. 24–25). On the other hand, economic constraints and technological developments have forced the rapid development of industrial-scale practices of fishing, processing, and trading within this branch. This is in opposition to the local, small-scale, and gradually developing character of human activities expressed in the arcadian view of sustainability. Their position therefore remains fairly close to the corner of critical natural capital in Figure 1b.

The Position of the Government

The Dutch government’s policy, the Core Decision on Planning of 1994 (PKB) for the Wadden Sea (VROM 1992, 1994), specifies a planning period lasting until 2010. The PKB document, approved by parliament, states its main objective to be “the sustainable protection and development of the Wadden Sea as a natural area” (VROM 1992:7). Economic and recreational activities should be allowed, however, within the specified conditions (VROM 1992:25). Current dams, embankments, coastal protections works, and water draining from the hinterland, however, are considered to be permanent (VROM 1992, p. 24).

The rationale for this objective (the response to the “why question”) is derived from the WCED concept of sustainability, mentioned in the introduction of this article (WCED 1987). It stresses, however, that “a policy effort should consider not only such values as public health and welfare but also the intrinsic value of plants, animals, and ecosystems” (VROM 1992:23). This position reflects the irreversible nature conception of sustainability. This is also true for the question of how to sustain fishing. The document calls for the interweaving of nature and exploitation functions, with these functions to be separated only in case of unacceptable effects (VROM 1992, p. 44). This has resulted in the management of open and closed areas and food reservation for birds, as described above in the section on shellfish harvesting. The PKB document subscribes to the following precautionary principle, which was formulated during the Sixth Trilateral Governmental Wadden Sea Conference in 1991 (CWSS 1992): “take action to avoid activities which are assumed to have significant damaging impact on the environment, even where there is no sufficient scientific evidence to prove a causal link between activities and their impact” (VROM 1992:28). With respect to the prioritization of concerns, the document specifies that necessity of societal interests and the location dependency of human activities in the Wadden Sea must be proven. In addition, compensation or substitution by the development of new natural areas in the event of temporal or lasting environmental degradation must be considered, but is not compulsory (VROM 1992, p. 8). More recently, the cultural value of the Wadden Sea area has been recognized. For example, the relevant ministries of the Netherlands, Germany, and Denmark intend to nominate the Wadden Sea area as a UNESCO World Heritage Site (CWSS 2001).

Taken together, these considerations locate the government’s document close to the irreversible nature conception, along the perpendicular of the triangle in Figure 1b.

Conclusions

The positions that we have identified for the fishery organization, the Wadden Society, and government are as expected. Shellfish fishery interests imply exploitation as

long as it is not counterproductive (in any economic, technical, or societal sense), and nature protection organizations can be expected to oppose fishing activities that have potentially negative ecological effects. The more or less intermediate position of the government is also not surprising, because democratic governments must often maneuver between influential but opposing social groups. Figure 1b also demonstrates that the involved parties can take mixed positions, related to specific circumstances. The Wadden Society allows for example arcadian-type cockle fishing by hand-gathering methods in the so-called open areas but follows a natural value conception in the closed areas. In general, we may expect that the discriminative power of the model increases at a finer geographical scale.

Our descriptive analysis also demonstrates, however, that all of the actors involved can indeed appeal to the concept of sustainability because of its wide spectrum of meanings. It shows that the method of asking the "Dobson questions" concerning actors or their documents can indeed clarify quite different positions that are masked by the general term of sustainability. We also conclude that Dobson's model does not provide a full account of the debate on sustainability and could be successfully extended with the arcadian nature conception.

The arcadian conception is arguably best known from the terrestrial literature, sometimes mingled with a romantic stance, but is less known in terms of marine environments. Indeed, examples of the arcadian vision in literature are frequently picturesque and tend to stress the importance of the immediate environment, including rather small settlements or village structures in terrestrial environments. Our arcadian approach is based more on ecological, ethical, and aesthetic considerations concerning the role of humans with respect to nature. The picturesque element is also important in our case, however, because the Wadden Sea is very much appreciated for its nature and panoramic views as well. The area is rather easily accessible, as illustrated by the leisure activity of "Wad-hiking" (i.e., walking over sand banks to the nearby islands).

The divergent positions of the Wadden Society and the fishery organizations make it unlikely that deliberation and communication will result in consensus in the debate about sustainable shellfish harvesting (Keulartz et al. 2004). A recent letter to parliament, in which the Dutch Cabinet announced the intention to ban mechanical cockle fishing completely, illustrates this (VROM 2004). At first sight, this decision seems to be completely consistent with the aims of the environmental movement. In the same letter, however, the Cabinet also resolves to permit the heavily disputed exploitation of natural gas in the Wadden Sea and to lift the current moratorium on the utilization of gas reserves. In a more general sense, the current Cabinet's position regarding the Wadden Sea seems to be close to the critical natural capital conception of sustainability. This debate demonstrates the potential conse-

quences that visions of sustainability may have for conservation practices and policies. The critical natural capital approach permits a reductionistic focus on a small number of species or other isolated features of an ecosystem and allows for many more trade-offs than do the more holistic natural value and arcadian nature approaches, which often consider the level of human or natural communities and systems. The ability to identify various conceptions of sustainability in concrete cases is therefore important.

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